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(54) Title of Invention

Diaper

(51) INT CL<sup>1</sup>; A61F 13/15

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KAOS D22 92-209939/26 =GB 2250921-B  
Elasticated frills on incontinence pads - using elasticated parts disposed  
in set directions to give three-dimensional tightening effect  
KAO CORP 91.10.03 91JP-256642 (90.11.30 90JP-336094)  
F07 P32 (95.06.21) \*GB 2250921-A A61F 13/15  
91.11.28 91GB-025374

A diaper including a main body having a liquid permeable topsheet, a liquid impermeable backsheet and absorbent core interposed therebetween, and a frill portion provided to the top sheet side of the main body and extending along a long direction of the main body to form a gather projecting from the main body when the diaper is in a relaxed state, wherein the frill portion is fixed at one side edge portion thereof along an extending direction thereto, the other side edge portion opposite to the one edge portion being a free edge portion which is provided with a first elastic member, the first elastic member being disposed in a direction intersecting the centre line in the long direction of the main body when the diaper is in a flattened state and wherein the whole of the one side edge portion is located between the centre line in the longitudinal direction and a side edge of the absorbent core and wherein the main body includes a second elastic member disposed at an outer side of the frill portion in the short direction of the main body, and along the long direction of the main body.

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Fig .1

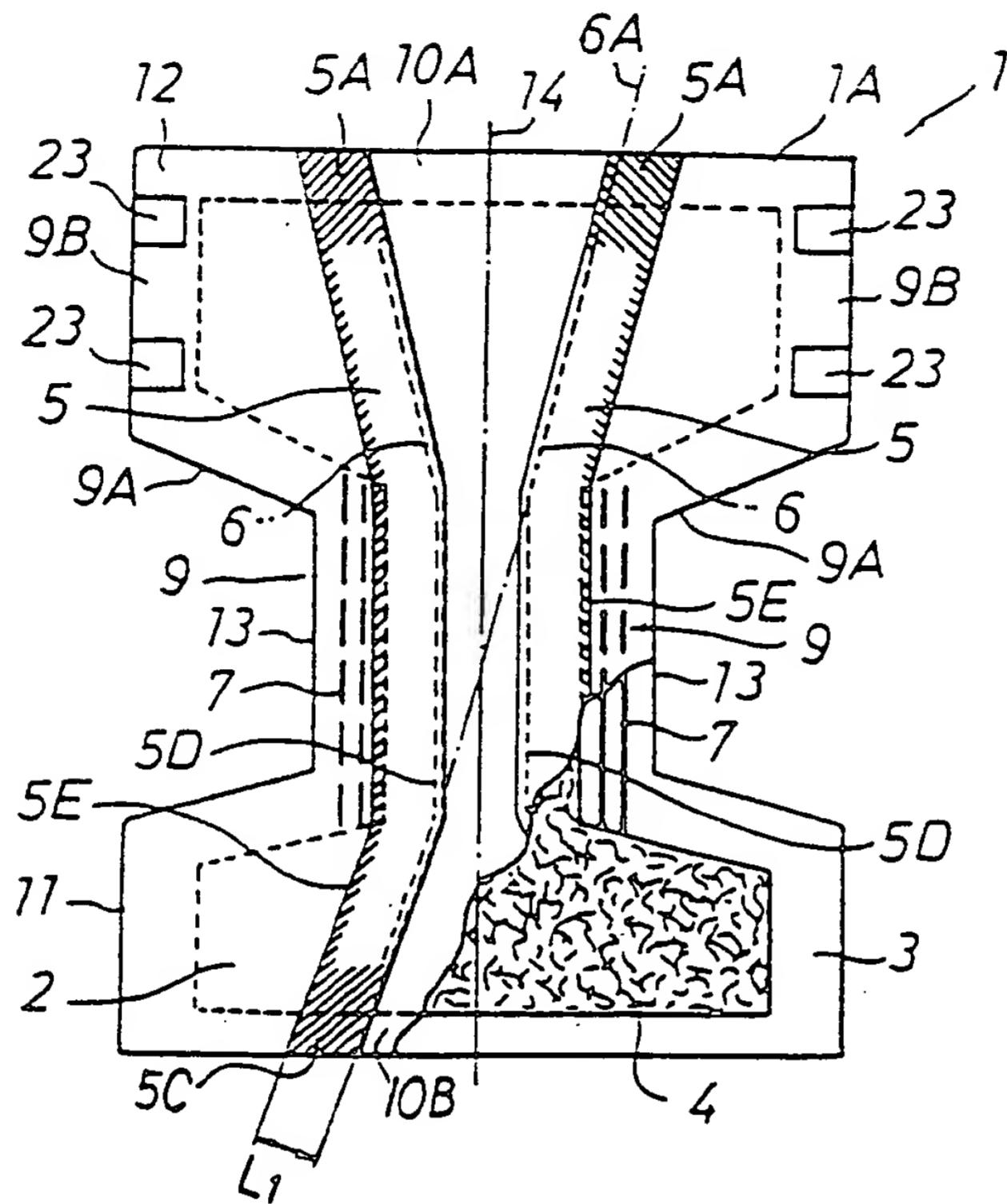


Fig .2

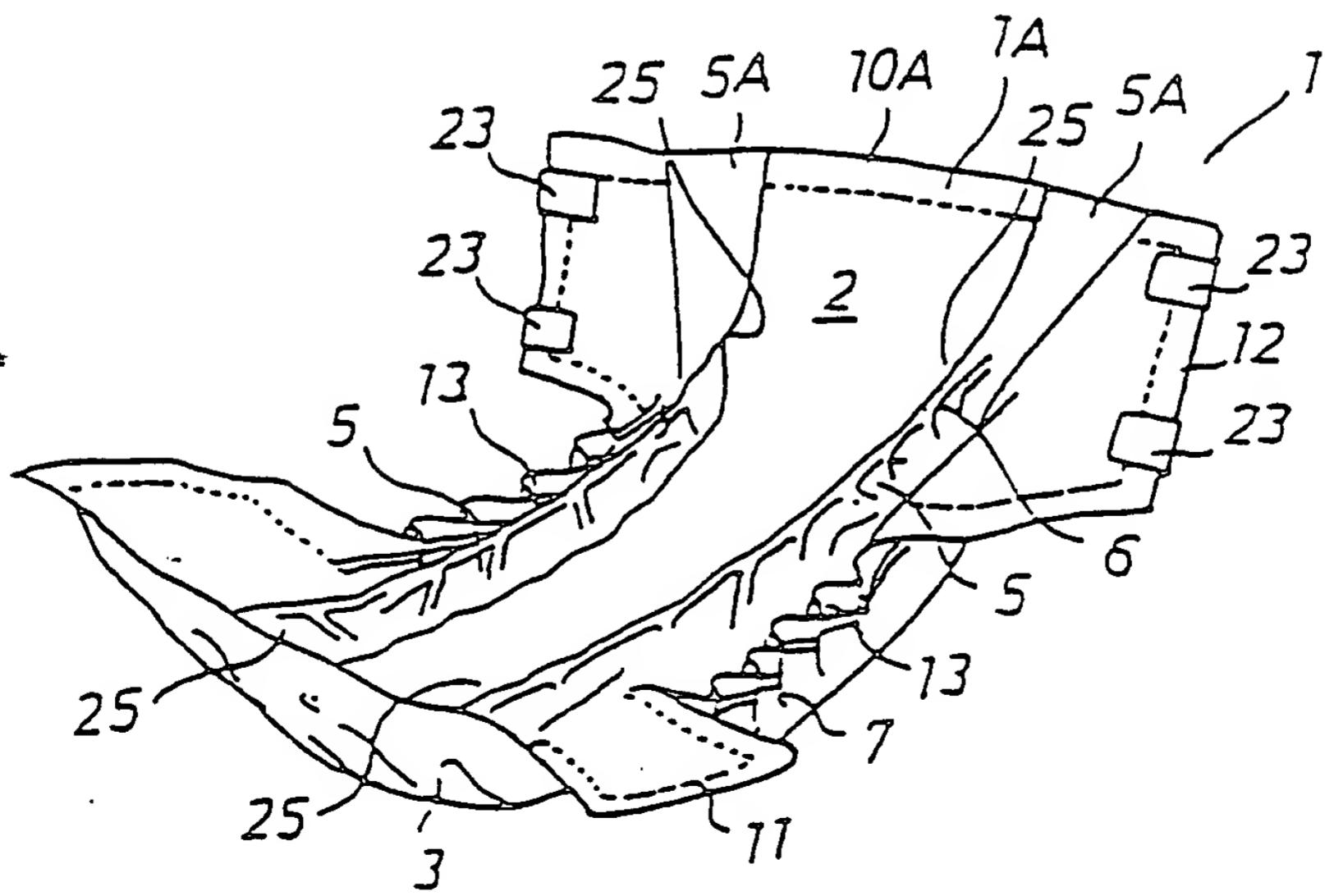


Fig .3

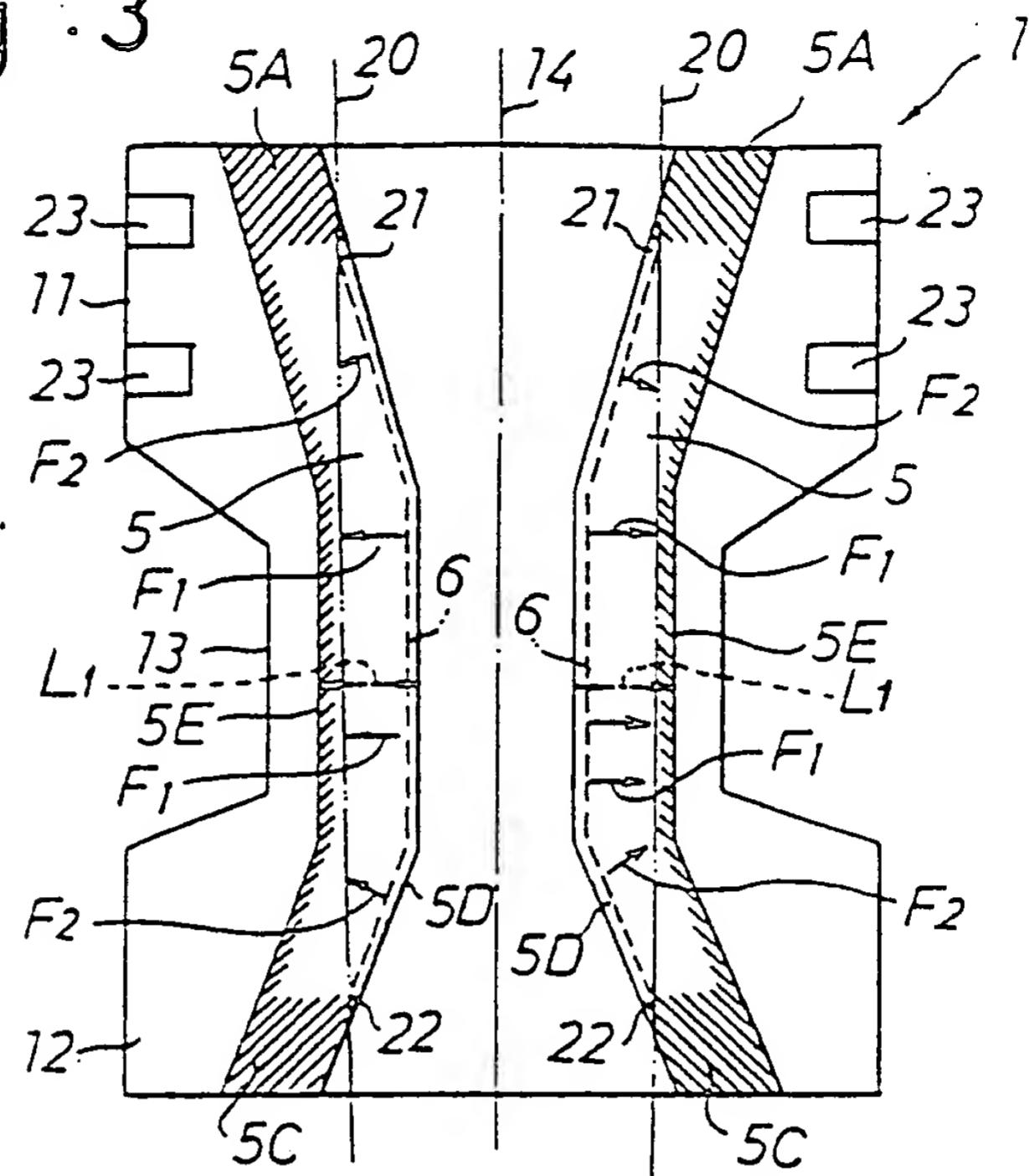


Fig .4

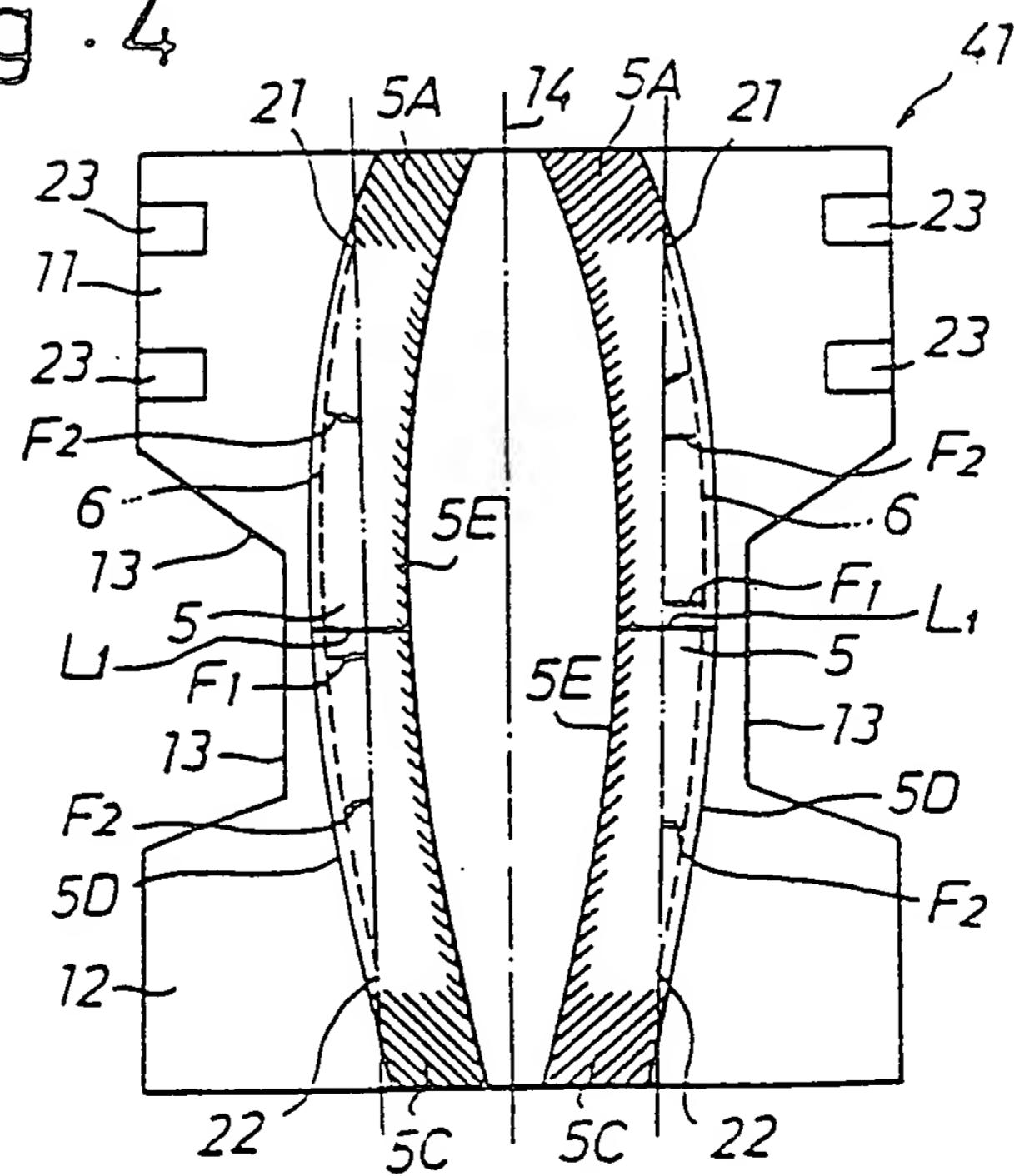


Fig. 5

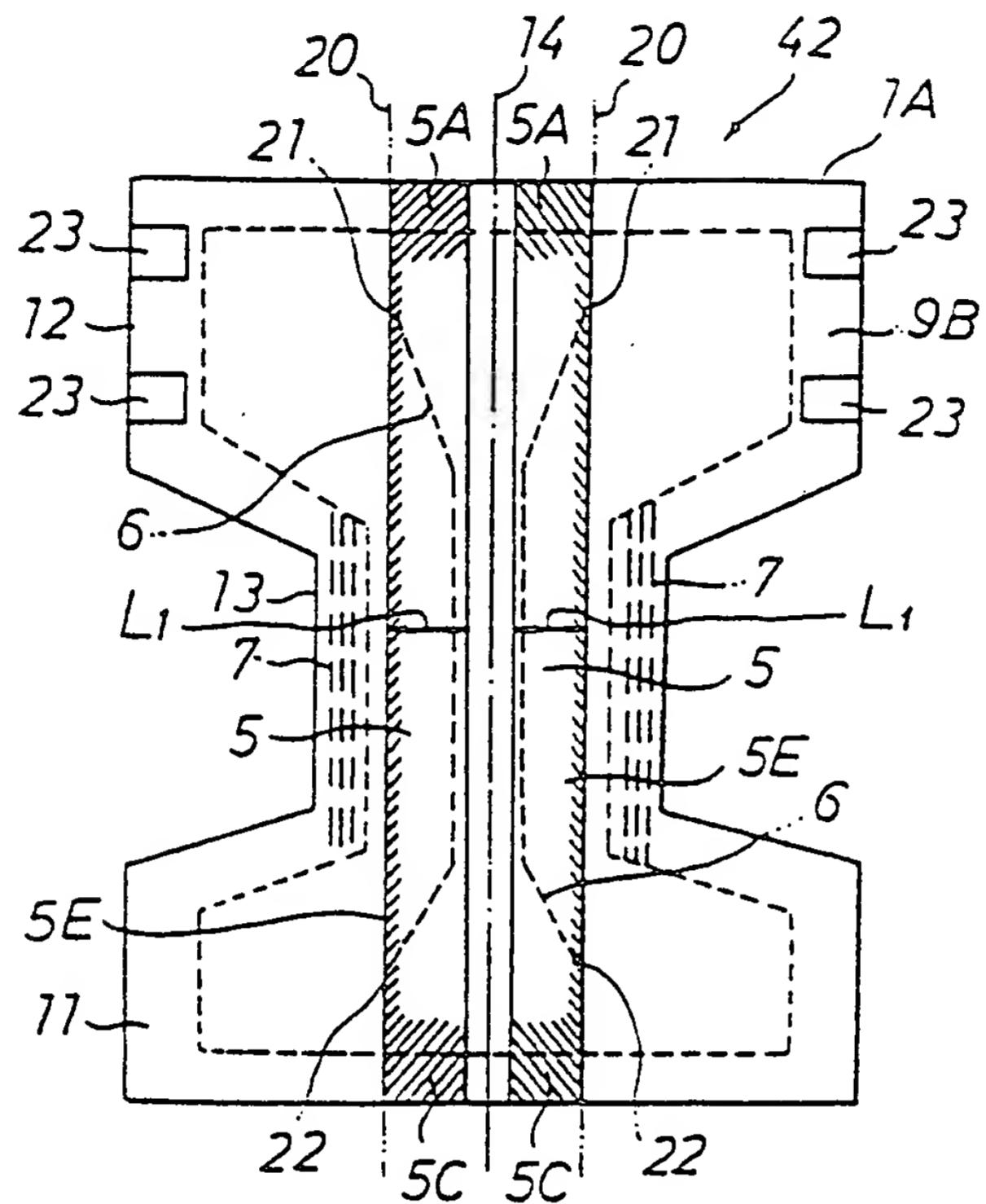


Fig. 6

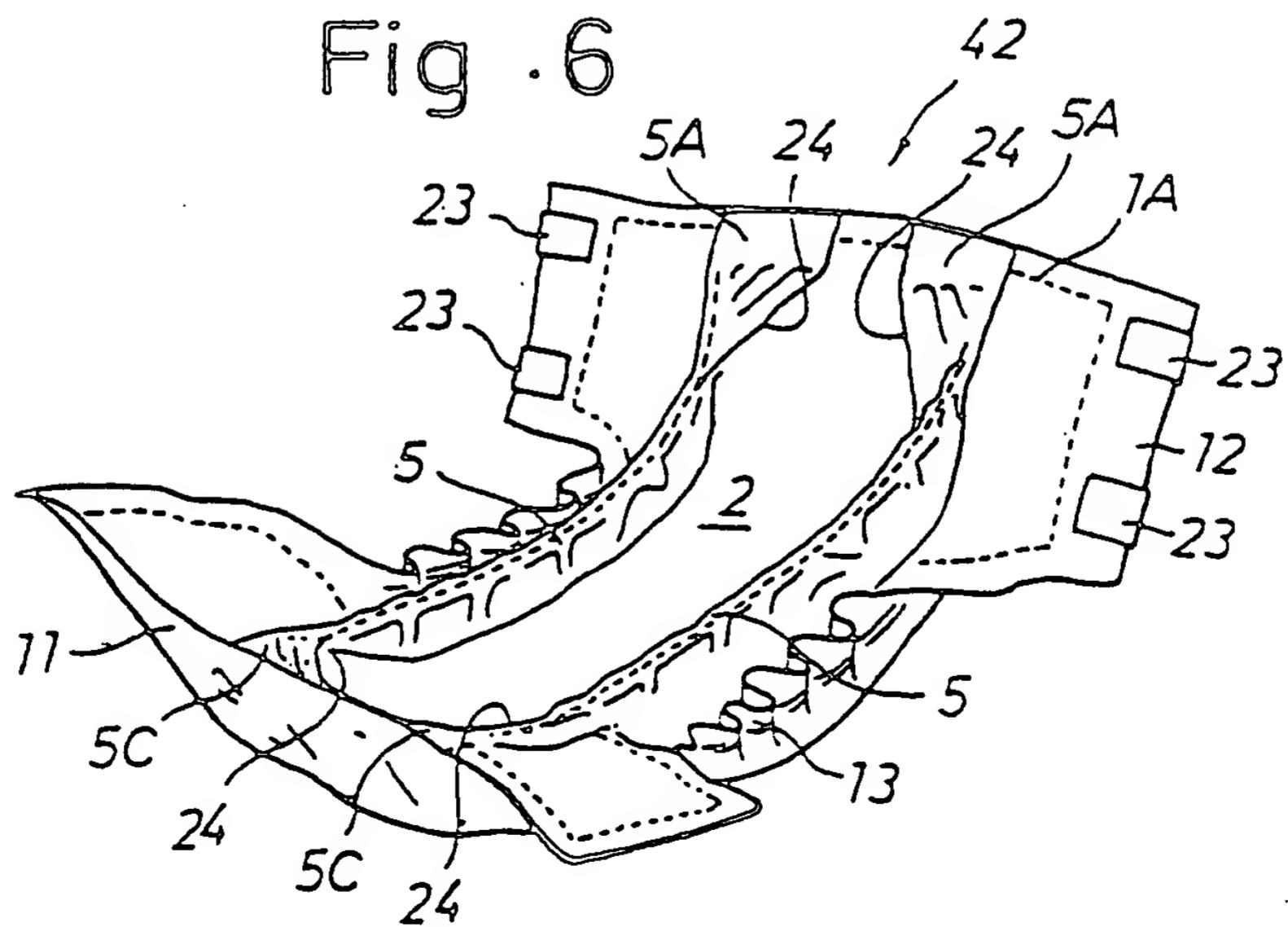


Fig .7a

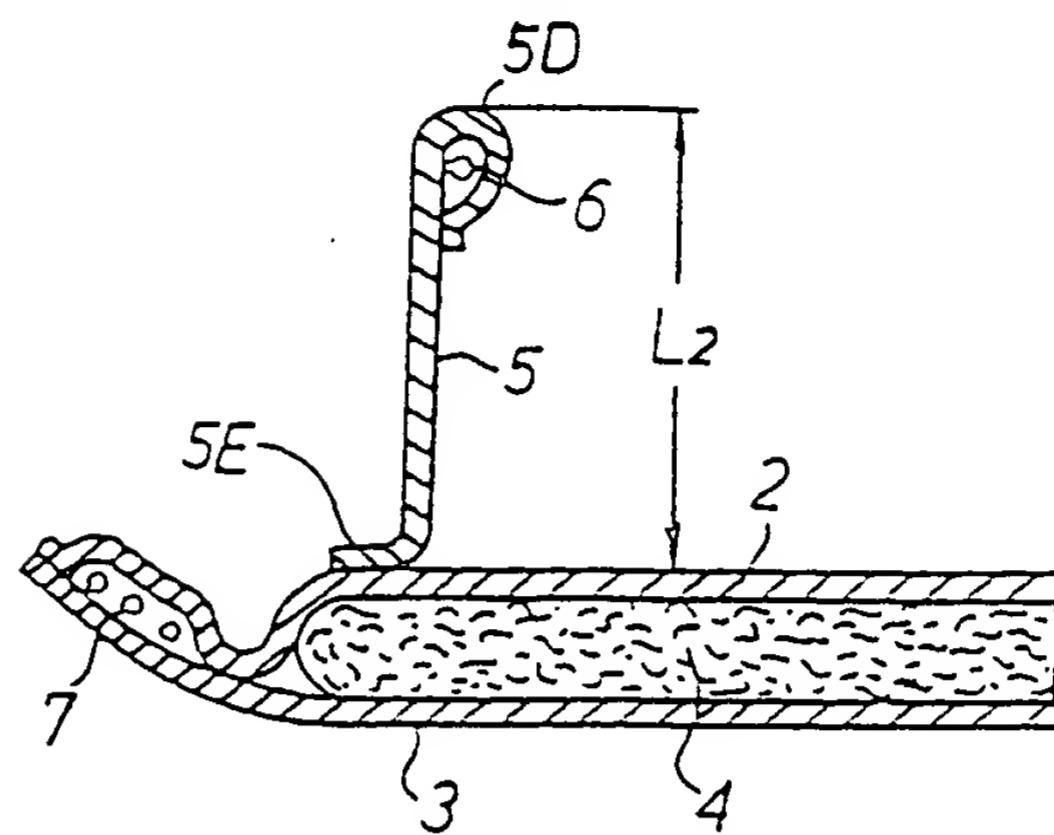


Fig .7b

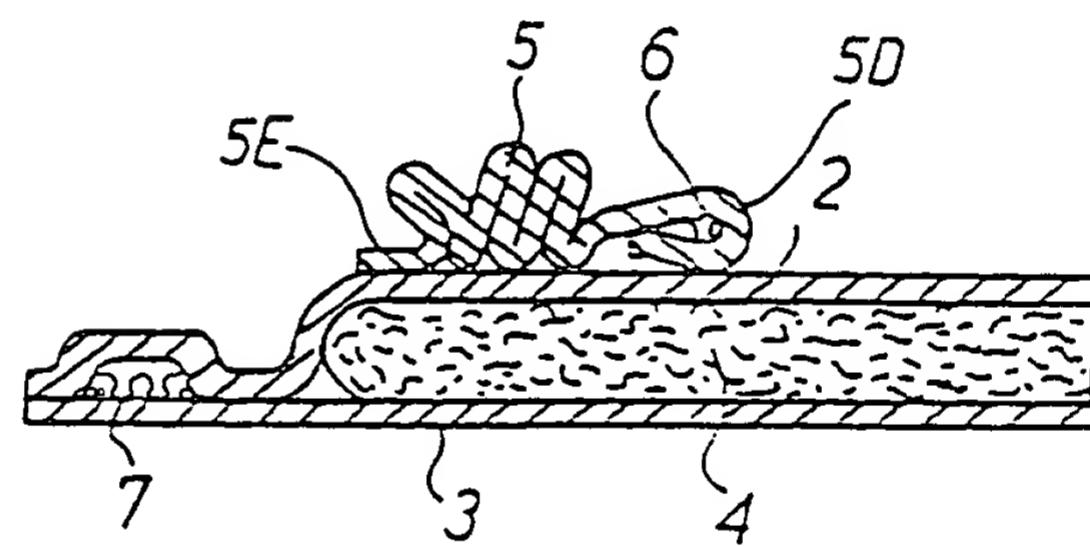


Fig .7c

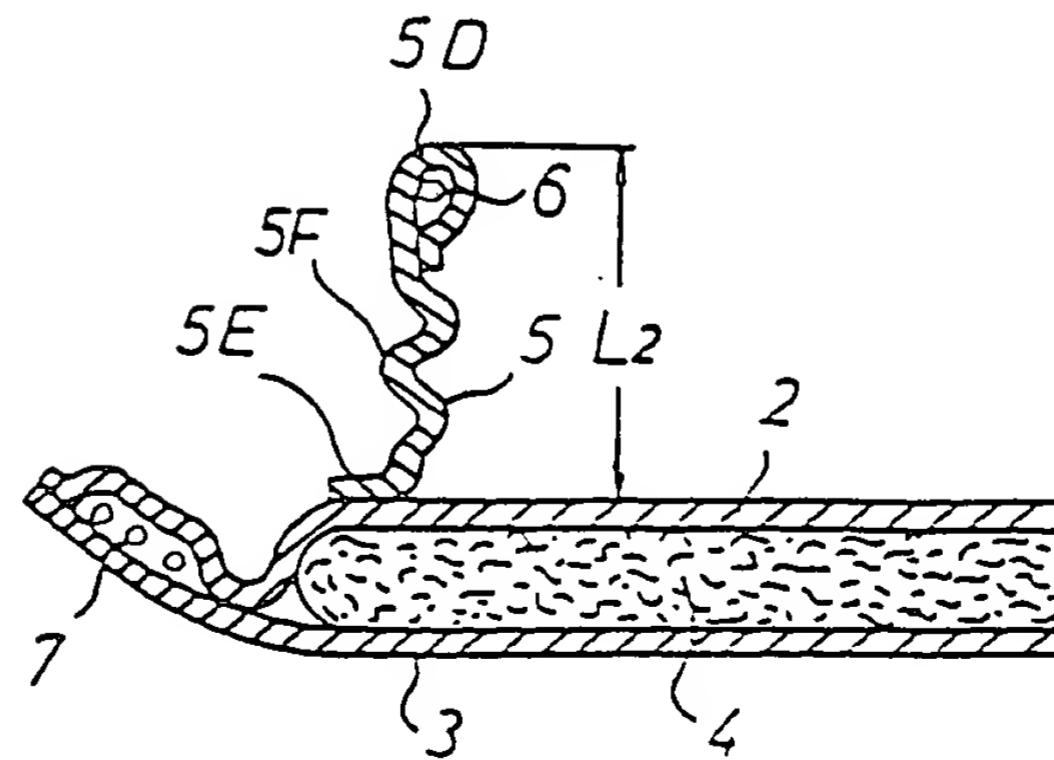


Fig. 8

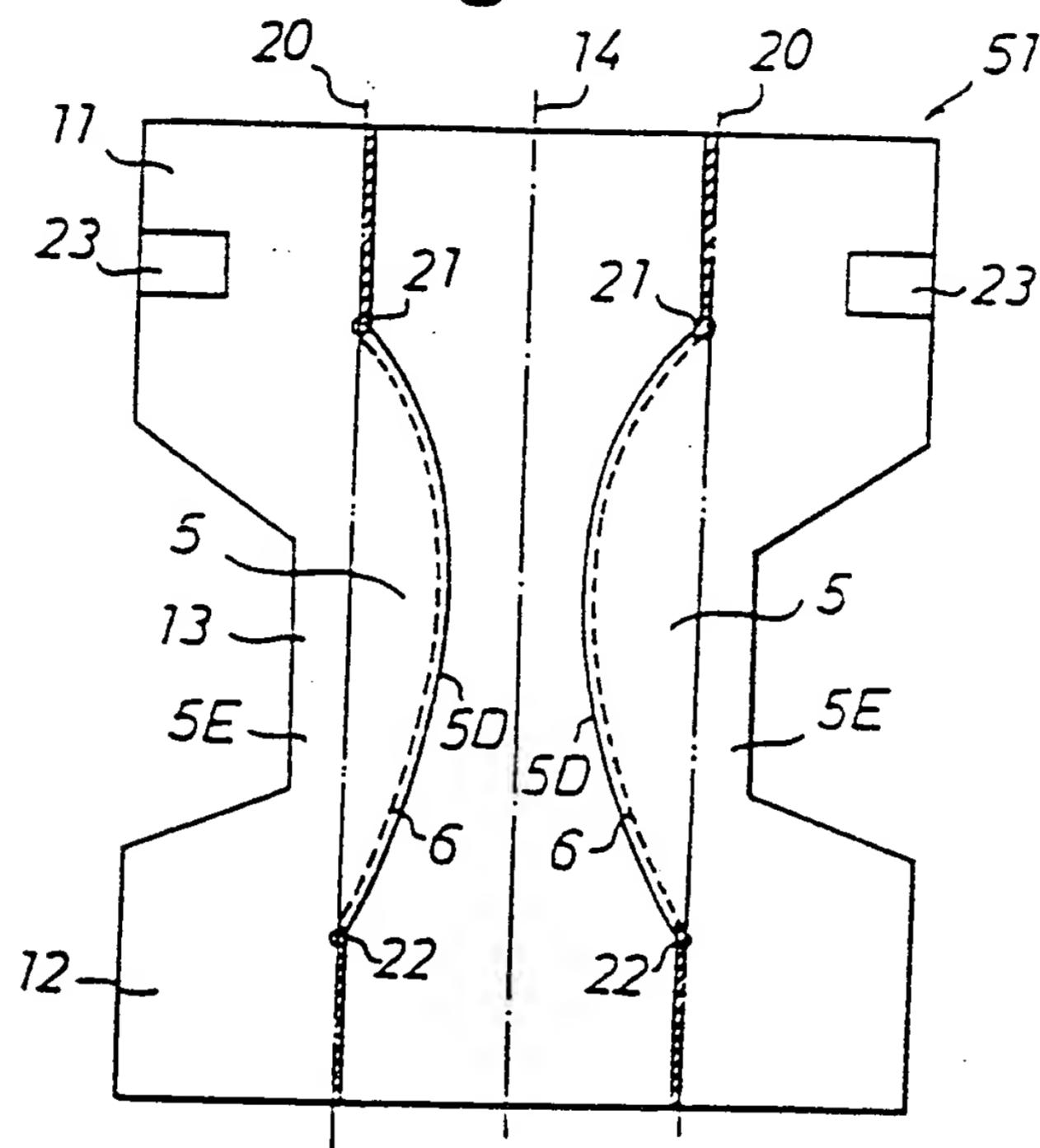


Fig. 9

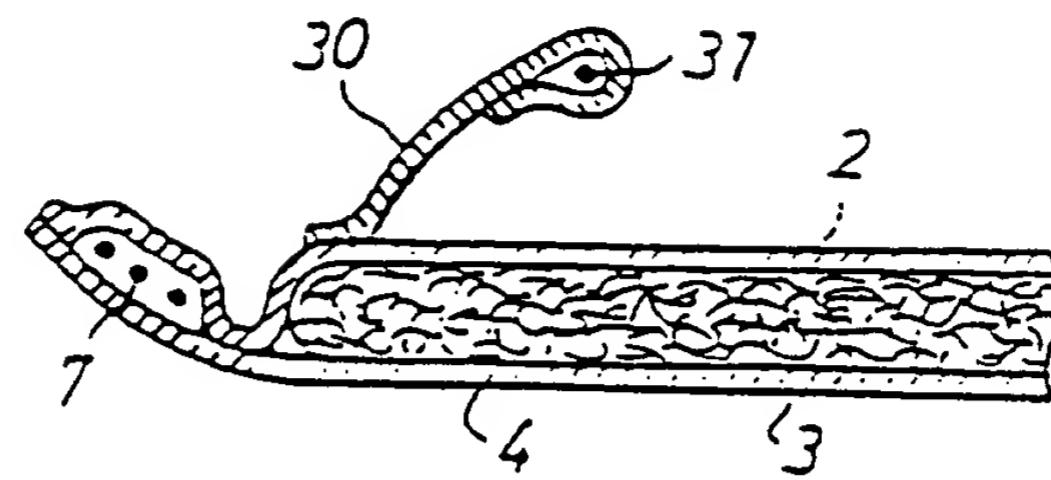
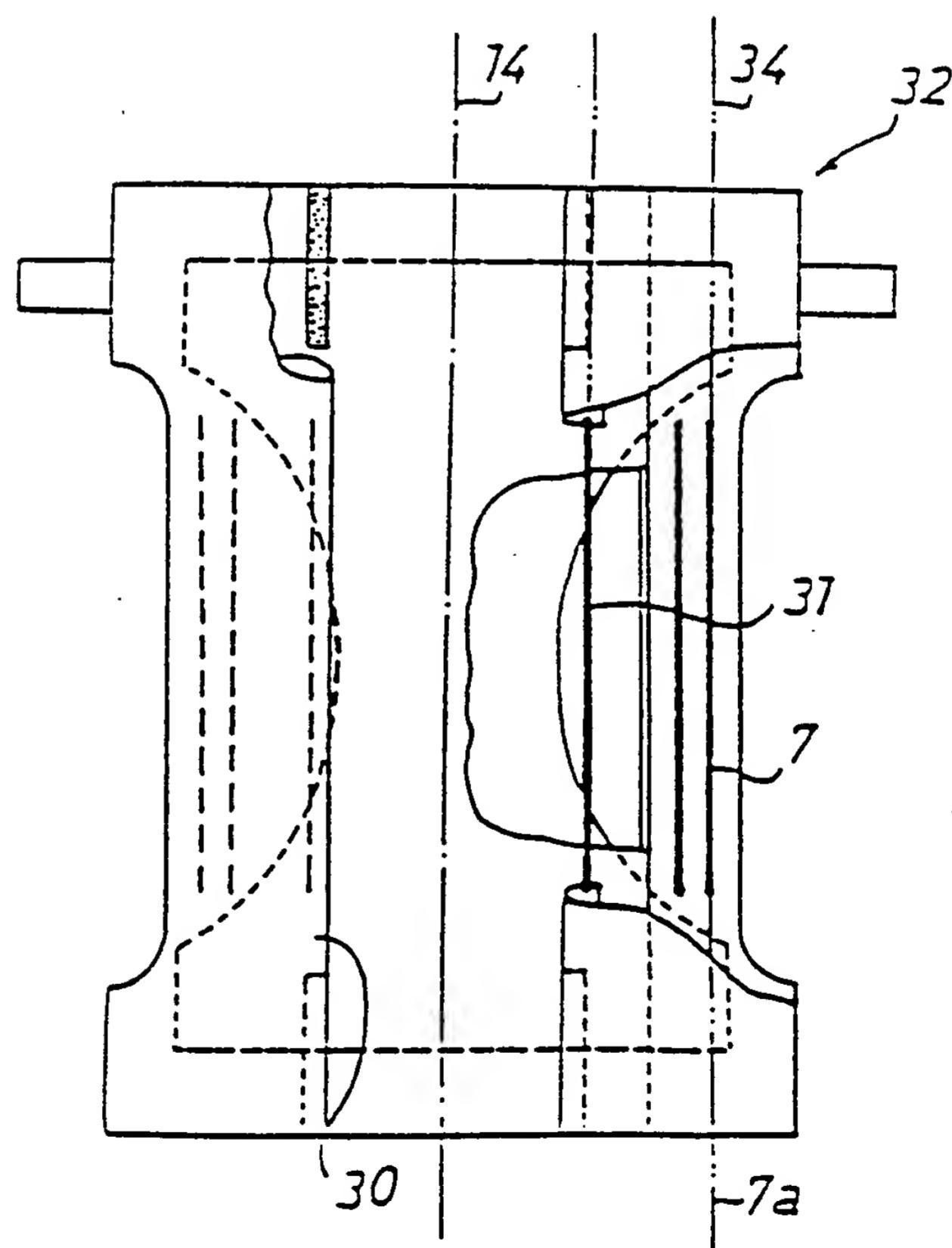


Fig. 10



DESCRIPTION

DIAPER

This invention relates to diapers, such as, for example, disposable diapers, which are designed for the use of infants, adults and incontinent.

Various kinds of leakage preventing structures have heretofore been proposed with respect to an under-crotch portion of a disposable diaper. For example, Japanese Patent Publication No. Sho 52-40267, Japanese Patent Early Laid-open Publication No. Sho 54-115939, Japanese Patent Early Laid-open Publication No. Sho 52-120045 and Japanese Patent Early Laid-open Publication No. Sho 57-89602 disclose disposable diapers in which gathers are provided, in advance, along side edge portions of the diaper and the diaper is intimately contacted to an under-crotch portion of their user in order to make it difficult to leak waste materials.

In recent years, there have been proposed disposable diapers in which expandible side wall portions are provided to their side flaps.

For example, Japanese Patent Early Laid-open Publication

No. Sho 62-250201 and Japanese Utility Model Early Laid-open Publication No. Sho 62-143311 disclose disposable diapers in which side wall portions (frill portions) stretching in the longitudinal direction of side flaps forming the so-called three-dimensional gathers are folded inwardly to form pocket portions so that accommodation characteristics of waste materials are improved. Also, Japanese Patent Early Laid-open Publication No. Sho 62-223303 discloses a disposable diaper in which frill portions are folded outwardly to form pocket portions for the purpose of improving accommodation characteristics of waste materials.

However, the above-mentioned disposable diapers having two kinds of frill portions had the following problems.

Although it is true that the first-mentioned disposable diapers having frill portions folded inwardly have pocket portions formed inwardly, the pockets are crushed or flattened during the time the diapers are worn and hardly exhibit the initially intended effects. On the other hand, the second-mentioned disposable diapers having frill portions folded outwardly have pocket portions facing outwardly. However, their accommodation characteristics of waste materials were not excellent.

Furthermore, in any of the above-mentioned prior art, as shown in Fig. 10, free ends of frill portions 30 are provided with an elastic member (first elastic member) 31 respec-

tively, the elastic members 31, when a disposable diaper 32 is in its free state, being contracted to bend a main body into a U-shape to erect the frill portions 30. However, since the elastic member 31 is disposed in substantially parallel with an extending direction (center line) 14 of the disposable diaper or with an extending direction 7a of an elastic member (second elastic member) 7 in the under-crotch portion, it is given only a force able to form the disposable diaper 32 into a U-shape and hardly acts as directional components for erecting the frill portions 30 or for maintaining the erected postures of the frill portions 30.

Because of the above reasons, it had such problems as that the frill portions 30, as shown in Fig. 10, are difficult to be erected and the erected frill portions 30 are readily crushed or flattened.

To solve the problems, there can be considered that the elasticity of the elastic member 31 is increased. However, the simple attempt for increasing the elasticity of the elastic member 31 does not solve the problems; it merely contracts the diaper and hurts the wearer's skin.

\*

An object of the present invention is to provide a diaper including a frill portion which is positively erected and hardly crushed or flattened.

The present invention has achieved the above object by providing a diaper including a main body having a liquid permeable topsheet, a liquid impermeable backsheet and absorbent core interposed therebetween, and a frill portion provided to said top sheet side of said main body and extending along a long direction of said main body to form a gather projecting from the main body when the diaper is in a relaxed state, wherein;

said frill portion is fixed at one side edge portion thereof along an extending direction thereof, the other side edge portion opposite to said one edge portion being a free edge portion which is provided with a first elastic member, said first elastic member being disposed in a direction intersecting the centre line in the long direction of said main body when the diaper is in a flattened state and wherein the whole of said one side edge portion is located between the centre line in the longitudinal direction and a side edge of said absorbent core and wherein said main body includes a second elastic member disposed at an outer side of said frill portion in the short direction of said main body, and along the long direction of said main body.

According to the diaper of the present invention, the elastic member disposed to the free edge portion of the frill portion forms the main body into a U-shape by its elasticity when the diaper is in use. At the same time, the elastic member erects the frill portion disposed along the long direction of the main body.

At this time, a planar force acts on the frill portion in such a manner as to erect the frill portion above the main body.

Furthermore, since the elastic member is disposed in the direction intersecting the center line in the long direction

of the main body, that is, in a direction substantially non-parallel with the center line of the main body, a force in a direction intersecting the plane of the frill portion is acted in addition to the afore-mentioned force in the planar direction. These forces altogether exhibit three-dimensional functions.

In this way, since the elastic member exerts a three-dimensional force on the frill portion, the frill portion can easily be erected and the erected frill portion is hardly crushed or flattened.

By way of example only, a specific embodiment of the present invention will now be described, with reference to the accompanying drawings, in which:-

Fig. 1 is a partly cut-away plan view of a disposable diaper which does not form part of the present invention but which shows certain features of the present invention;

Fig. 2 is a perspective view of the disposable diaper shown in Fig. 1;

Fig. 3 is a view showing the function of the disposable diaper shown in Fig. 1;

Fig. 4 is a view showing the function of a disposable diaper which does not form part of the present invention but which shows certain features of the present invention; .p170

Fig. 5 is a plan view of a disposable diaper

according to an embodiment of the present invention;

Fig. 6 is a perspective view of the disposable diaper shown in Fig. 5;

Fig. 7(a) is a sectional view showing an erected state of a frill portion according to a disposable diaper;

Fig. 7(b) is a sectional view showing a folded state of the frill portion in its loosened condition; and

Fig. 7(c) is a sectional view showing an erected state of the frill portion but with a loosened condition formed therein, none of which form a part of the present invention, but which show certain features of the present invention;

Fig. 8 is a plan view of a disposable diaper which does not form part of the present invention but which shows certain features of the present invention;

Fig. 9 is a sectional view showing an erected state of a frill portion according to a conventional disposable diaper; and

Fig. 10 is a plan view of the conventional disposable diaper.

One diaper will be described in detail with reference to Figs. 1 through 3 and Figs. 7(a) through 7(c), although the diaper does not form part of the present invention.

In this diaper, as an absorbent article, an infant's disposable diaper will be described.

As shown in Figs. 1 through 3, a disposable diaper 1 in-.....

cludes a main body 1A comprising a liquid permeable topsheet 2 forming the side contacting a wearer's skin, a liquid impermeable backsheet corresponding to the topsheet 2, and an absorbent core 4 fixedly interposed between the backsheet 3 and the topsheet 2 and adapted to absorb waste materials. The diaper's main body 1A includes a pair of waist flaps 10A, 10A extending outwardly of both ends in the long direction of the absorbent core 4, a pair of side flaps 9, 9 extending outwardly in the width direction from both side edges in the long direction of the absorbent core 4, and a pair of frill portions 5, 5 each fixedly connected at a part thereof to the body's side surface of the topsheet 2.

The side flaps 9, 9 are formed by integrally overlapping the topsheet 2 and the backsheet 3. Second elastic members 7, 7 are stretched between the sheets 2 and 3. The topsheet 2 and the backsheet 3 are preferably of a substantially equal dimension. However, they may be formed such that one of them is longer than the other.

The diaper's main body 1A is formed in a vertically elongated generally square shape. Arcuately indented portions 9A are formed at both side edges of the main body 1A. The disposable diaper 1 is formed of a stomach side portion 11 which comes to the wearer's stomach side when the diaper is worn, and a back side portion 12 which comes to the wearer's back side when the diaper is worn. In Fig. 1, the

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stomach side portion 11 is located in a lower part, and the back side portion 12 is located in an upper part. Between the stomach side 11 and the back side 12, an under-crotch portion 13 is formed. This under-crotch portion 13 is a portion including the afore-mentioned indented portions 9A.

The side flaps 9B, 9B in the back side portion 12 are provided with tape fasteners 23, 23. Each of the tape fasteners 23, 23 is preferably provided at a central portion in the width direction thereof with an extensible member adapted to enhance the fitness around the wearer's waist. The waist flaps 10A and 10B may be provided with a third elastic member stretched in the width direction thereof.

The pair of frill portions 5, 5 extend from the back side waist flap 10A to the stomach side waist flap 10B along a center line 14 in the long direction of the diaper's main body 1A.

The frill portions 5, 5 are arranged in symmetric relation with the center line 14 disposed therebetween. Each of the frill portions 5, 5 is fixedly connected its entire surface at a basal end portion 5A located in the back side waist flap 10A and at a distal end portion 5C located in the stomach side waist flap 10B to the topsheet 2. Each of the frill portions 5, 5 is fixed to the topsheet 2 at one side edge portion thereof along its extending direction as a fixed edge portion 5E.

The pair of frill portions 5, 5 are separated from each other the most at the basal end portions 5A, 5A and at the distal end portions 5C, 5C. The distance between the frill portions 5, 5 become gradually shorter from the basal end portion 5A and distal end portion 5C to the under-crotch area. It becomes equidistant at the side flap 9. In other words, the pair of the frill portions 5, 5 are in generally parallel relation at the side flap 9. As a result, each of the frill portions 5, 5 forms a curved configuration as a whole. In mutually opposing position, the outer sides of the frill portions 5, 5 are the fixed edge portions 5E and the opposing inner sides thereof are free edge portions 5D. Each of the frill portions 5, 5 has a first elastic member 6 stretched at its free edge portion 5D. More specifically, the first elastic member 6 is arranged in a curved configuration as a whole, as in the frill portion 5. The member 6 is not parallel with the center line 14 of the diaper's main body 1A over the substantially entire length thereof. At least a part of the first elastic member 6 intersects the center line 14 at its extension 6A.

The frill portion 5 is formed of a sheet member with the first elastic member 6 stretched thereon. The sheet member preferably has a hydrophobic property and is preferably breathable. The whole width of the frill portion 5 is constant, and the first elastic member 6 linearly stretched

along the free edge portion 5D of the frill portion 5 and wrapped up with the sheet member. The first elastic member 6 is elastically fixed preferably between the basal end portion 5A to the distal end portion 5C in a continuously expandable state. It is defined here that the line showing the expanding/contracting direction of the elastic member when the frill portion 5 is completely stretched is an elastic expansion line.

The fixed edge portion 5E of the frill portion 5 is disposed between the second elastic member 7 of the side flap 9 and the center line 14 of the main body 1A, in the under-crotch portion 13. The whole width of the frill portion 5 is at least 10 mm and preferably in a range from 30 mm to 60 mm.

Although the first elastic member 6 is shown as a single number of elastic member, it is preferably a single number of thready elastic member. It is not limited, however, whether the member is a tape-like elastic member or whether it is a plural number of elastic members. In general, as a material of such elastic member, there can be listed a tape-like or thready elastic core. It is particularly preferable that the material is 100 g or less in stress when it is stretched 150 %. However, it is not particularly limited as long as it has an expandable elasticity. A fiber of a water contractibility may be used.

A similar material is used for the second elastic member 7, too. In this case, the elastic expansion line is a line along the outermost edge of the elastic member 7 when the member 7 is a tape-like member. However, when the member 7 is plural, the elastic expansion line refers to a line along the outermost member.

The frill portions 5 and the topsheet 2 may be connected and attached together by any suitable means known in the art. It is not limited to a hot melt type adhesive. An ultrasonic welding, a heat welding or the like may be used.

The topsheet 2 is preferably formed of a material having a hydrophobic property such as fiber non-woven fabrics, perforated plastic film, etc. It can be optionally selected whether the topsheet 2 should be totally hydrophobic or the peripheral part of the topsheet 2 should be water-repellent, depending on the mode of the embodiment of the present invention.

Examples of the backsheet 3 include a moisture-permeable plastic film obtained by stretch molding a thermoplastic resin added with a filler, a fiber non-woven fabric having a heavy water repellent property, a sheet formed of a multi-layer thereof, etc.

A sheet material forming the frill portion 5 may be those used for the topsheet 2 and backsheet 3.

Examples of the absorbent core 4 include a material

chiefly composed of an open cell pulp, and a water absorbable high polymer added thereto. Otherwise, a material composed of a thermoplastic resin, a cellulosic fiber and a water-absorbable high polymer which are subjected to heat treatment.

Next, operation of this diaper will be described.

To wear the disposable diaper 1 the diaper 1 is developed as shown in Fig. 1, and then it is allowed to take a natural state wherein the diaper 1 is bent into a U-shape as shown in Fig. 2. Then, it is brought into contact with the under-crotch portion of the infant. At that time, it is made sure that the back side portion 12 comes to the back side of the infant and the stomach side portion 11 comes to the stomach side. Thereafter, the tape fastener 23 on the back side is fastened to the back sheet 3 on the stomach side.

In the developed state, as shown in Fig. 3, the first elastic members 6 pull the free edge portions 5D of the frill portions 5 such that the frill portions 5 are contracted in the long direction. The first elastic member 6 coacts together with the second elastic members 7 to form the diaper's main body 1A into a U shape as shown in Fig. 2. At that time, since the first elastic members 6 tend to pass the shortest distances between the basal end portion 5A and the distal end portion 5C, they are contracted generally along

imaginary expansion lines 20 when the disposable diaper 1 is left in a free state. The imaginary expansion lines 20 used herein refer to the straight lines interconnecting the fixed ends 21 and 22 in the longitudinal direction of the first elastic members 6 which are disposed at the free edge portions 5D of the frill portions 5, as shown in Fig. 3. When the imaginary expansion lines 20 and the fixed edge portions 5E are aligned, in other words, when the distance between the corresponding lines 20 and portions 5E becomes 0 in the width direction, the frill portions 5 can form weirs taking advantage of their full widths. At that time, the frill portions 5 are erected as shown in Fig. 7(a) and, theoretically, act most efficiently in all directions in three-dimension. The term "theoretically" is used here because actually, the frill portions 5 receive at least the contracting force of the second elastic members 7 which are disposed on the side flaps 9, 9.

On the other hand, since the first elastic members 6 are partially spaced apart from the center line 14 in substantially parallel relation, the first elastic members 6 are acted with forces in a direction intersecting the imaginary expansion lines 20. However, the intersecting forces including not only the forces  $F_1$  intersecting the imaginary expansion lines 20 at right angles but also the forces  $F_2$  diagonally intersecting the lines 20.

Although the forces  $F_1$  in the direction intersecting the imaginary expansion lines 20 at right angles act on the frill portions 5 to erect thereof, they mostly act as forces in a planar direction relative to the height direction of the frill portions 5. On the other hand, the forces  $F_2$  diagonally intersecting the lines 20 act in a direction intersecting the plane of each frill portion 5. As a consequence, a substantially three-dimensional forces act on the frill portions 5.

Accordingly, since not only forces in the planar direction but also the first elastic members 6 as three-dimensional forces act on the frill portions 5, they act to erect the frill portions 5 generally perpendicular to the topsheet 2 and keep the foregoing states as shown in Fig. 7(a).

In this diaper, pockets 25 are formed between the frill portions 5 and the topsheet 2 in order to accommodate waste materials therein.

Further, this disposable diaper is provided with a loosened portion 5F, which is formed between the fixed edge portion 5E of the frill portion 5 and the free edge portion 5D in at least an under-crotch area thereof and which is loosening in the erected direction of the frill portion 5 as shown in Fig. 7(c).

Therefore, according to this disposable diaper 1

since the frill portion 5 forms the loosened portion 5F as shown in Fig. 7(b) and is readily folded when the diaper 1 is stretched in the long direction by holding the front and rear ends thereof at the time the diaper 1 is worn, the diaper 1 can easily be fitted to the wearer. On the other hand, when the diaper 1 is worn, the elastic member 6 provided to the free edge portion 5D of the frill portion 5 forms the main body 1A in a U-shaped design with its elastic force. At the same time, the member 6 causes the frill portion 5, which is disposed along the long direction of the main body 1A, to be erected.

In this way, the frill portion 5 having the loosened portion 5F makes it easy to erect the frill portion 5, and the erected frill portion 5 is hardly crushed or flattened. Further, since various physical restrictions acting on the frill portion 5 can be removed by the loosening, the frill portion 5 can be erected in generally vertical relation with respect to the diaper's main body 1A. In a state where a body pressure is applied to the frill portion 5, the loosened portion 5F is formed, as shown in Fig. 7(c), to ease the stress. Since no adverse effect is exerted to the elasticity of the elastic member 6, the frill portion 5 is maintained in its erected state and is thus able to prevent leakage of waste materials. The height of the frill portion 5 (or the height of the weir) in its erected state can be

designed freely and easily.

The degree of loosening in the loosened portion 5F can be expressed by a ratio  $L_2/L_1$  between the width  $L_1$  and the height  $L_2$  of the weir. This  $L_2/L_1$  is preferably 1, as shown in Fig. 7(a), when the diaper is worn. In a state where a body pressure is applied, the ratio  $L_2/L_1$  is preferably 0.4 to 0.9 and particularly preferably 0.5 to 0.8, as shown in Fig. 7(c). If the ratio is smaller than 0.4, the degree of loosening exceeds a desirable level and the frill portion 5 becomes more easily crushed. In addition, the opening degree of the pocket becomes insufficient. On the contrary, if the ratio is larger than 0.9, a loosening is hardly taken place. As a result, it becomes difficult to obtain an easy erection of the frill portion 5 and to prevent the crush of the frill portion 5.

Operation of the disposable diaper 1 will now be described along with the operation of the loosened portion 5F formed in the frill portion 5.

In the developed state of this disposable diaper 1 as shown in Fig. 3, the first elastic members 6, 6 pulls the free edge portions 5D of the frill portions 5, 5 such that the long direction of the frill portions 5, 5 are contracted, to bend the diaper's main body 1A into a U-shape. At this time, as shown in Fig. 7(c), the frill portions 5, 5 with the free edge portions 5D, 5D, which are

provided with the first elastic members 6, 6, located on upper parts thereof can be erected in generally vertical relation with respect to the topsheet 2, and the foregoing state can be maintained. When the imaginary expansion lines 20 and the fixed edge portions 5E are in alignment or when a distance therebetween becomes 0 in the width direction in the first elastic members 6, 6, the frill portions 5 can form the weirs taking advantage of the loosening portions 5F the most.

As apparent from a comparison between the diaper of Fig. 7 (C) and the prior art of Fig. 10,

the frill portion 5 works flexibly and efficiently in all directions when compared with the construction of the prior art frill portion. Further, by changing the loosened portion 5F, i.e., the entire width  $L_1$ , of the frill portion 5, the height of the weir can easily be changed. On the other hand, since the distance between the imaginary expansion lines 20, 20 of the elastic members 6, 6 is not narrowed, a discharging point of the wearer is not swollen out of the pocket portion when the diaper 1 is worn, and the frill portion 5 can easily be designed.

Next, other diapers will be described with reference to Figs. 4 through 8. In other diapers to be described hereinafter, identical parts to those of the above-mentioned diaper are denoted by identical reference numerals, and detailed description thereof

will be omitted.

In a disposable diaper 41 shown in Fig. 4, a pair of frill portions 5, 5 are bent in a streamline configuration, respectively. In this embodiment, the dimensions between the basal end portions 5A and 5A, and between the distal end portions 5C and 5C of the frill portions 5 are comparatively narrow, while the dimension thereof at a generally central portion corresponding to the under-crotch portion 13 is comparatively wide.

Furthermore, the pair of frill portions 5, 5 are provided at opposing inner sides thereof with a fixed edge portion 5E, respectively, and at outer sides thereof with a free edge portion 5D, respectively.

Also in such constituted disposable diaper 41 there can be obtained the same effects as in the disposable diaper 1 described previously.

In a disposable diaper 42 according to an embodiment of the present invention, shown in Fig. 5, frill portions 5 are connected to the diaper's main body 1A in such a manner as to be in substantially parallel relation with respect to the center line 14 in the long direction of the body 1A. Since each frill portion 5 is provided with a first elastic member 6, it is bent inwardly. Fixed ends 21, 22 of such bent first elastic member 6 are substantially overlapped with the fixed edge por-

tion 5E of the frill portion 5, while the imaginary expansion line 20 of the elastic member 6 and the fixed edge portion 5E are in alignment with each other.

Fig. 6 shows a disposable diaper 42 of Fig. 5 but in a free state and viewed from the topsheet 2 side. As is shown in Fig. 6, each frill portion 5 is erected generally perpendicular to the surface sheet 2 of the diaper's main body 1A. In this ~~third~~ embodiment, pockets 24, 24 are formed between the frill portion 5 and the topsheet 2, and between the basal end portion 5A and distal end portion 5C in the vicinity of both end portions in the longitudinal direction of the disposable diaper 42 and the topsheet 2. The pockets 24, 24 serve to effectively prevent leakage of waste materials from the waist portion.

In a disposable diaper 43 shown in Fig. 8, seats, which form the frill portions 5, 5, are integral with the side flaps 9, 9. The first elastic member 6 is disposed in a curved form. Arrangement being such that when the diaper 43 is left in a free state, a loosened portion 5F is formed between the free edge portion 5D and the fixed edge portion 5E. In this diaper, the amount of loosening of the loosened portion 5F is greatest at a central portion of the under-crotch portion 13 and smallest at both end portions thereof. In this way, because of the irregular location of the

loosened portion 5F, the diaper can easily be designed in the form of segments.

There can be obtained the substantially same effects in the disposable diapers 43 as for the diapers described previously. ~~embodiments as in the earlier embodiments.~~

It should be noted that the present invention is not limited to the above-mentioned embodiment. It can of course be modified within the scope of the present invention.

For example, in the frill portion 5, an absorbent core may be interposed between the fixed edge portion 5E and the free edge portion 5D. In that case, since the frill portion 5 including the absorbent core forms a pocket, the waste material absorption characteristics of the disposable diaper can be more extensively improved. In case an absorbent core is inserted in such frill portion 5, the core is preferably hydrophobic either at a part thereof or at its entirety.

CLAIMS

1. A diaper including a main body having a liquid permeable topsheet, a liquid impermeable backsheet and absorbent core interposed therebetween, and a frill portion provided to said top sheet side of said main body and extending along a long direction of said main body to form a gather projecting from the main body when the diaper is in a relaxed state, wherein;

    said frill portion is fixed at one side edge portion thereof along an extending direction thereof, the other side edge portion opposite to said one edge portion being a free edge portion which is provided with a first elastic member, said first elastic member being disposed in a direction intersecting the centre line in the long direction of said main body when the diaper is in a flattened state and wherein the whole of said one side edge portion is located between the centre line in the longitudinal direction and a side edge of said absorbent core and wherein said main body includes a second elastic member disposed at an outer side of said frill portion in the short direction of said main body, and along the long direction of said main body.

2. A diaper as claimed in claim 1, wherein a relaxed portion relaxed in the projecting direction of said frill portion is formed between a fixed edge portion of said frill portion and said free edge portion in at least an under-crotch area of said diaper when the diaper is in a relaxed state.

3. A diaper substantially as herein described, with reference to, and as illustrated in, Figs. ~~4-8~~<sup>5 and 6</sup> of the accompanying drawings.

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